

WE CLAIM:

1. An isolated DNA molecule comprising a DNA sequence coding for a dicamba-degrading oxygenase.

2. The DNA molecule of Claim 1 comprising a DNA sequence coding for a dicamba-degrading oxygenase having the amino acid sequence of SEQ ID NO:4.

3. The DNA molecule of Claim 2 comprising the nucleotide sequence of SEQ ID NO:3.

4. A DNA construct comprising a DNA sequence coding for a dicamba-degrading oxygenase operatively linked to expression control sequences.

5. The DNA construct of Claim 4 comprising a DNA sequence coding for a dicamba-degrading oxygenase having the amino acid sequence of SEQ ID NO:4.

6. The DNA construct of Claim 5 comprising the nucleotide sequence of SEQ ID NO:3.

7. The DNA construct of Claim 4 which is a vector.

8. An isolated and at least partially purified dicamba-degrading oxygenase.

9. The dicamba-degrading oxygenase of Claim 8 having the amino acid sequence of SEQ ID NO:4.

10. An isolated DNA molecule comprising a DNA sequence coding for a dicamba-degrading ferredoxin.

11. The DNA molecule of Claim 10 comprising a DNA sequence coding for a dicamba-degrading ferredoxin having the amino acid sequence of SEQ ID NO:6.

12. The DNA molecule of Claim 11 comprising the nucleotide sequence of SEQ ID NO:5.

13. A DNA construct comprising a DNA sequence coding for a dicamba-degrading ferredoxin operatively linked to expression control sequences.

14. The DNA construct of Claim 13 comprising a DNA sequence coding for a dicamba-degrading ferredoxin having the amino acid sequence of SEQ ID NO:6.

15. The DNA construct of Claim 14 comprising the nucleotide sequence of SEQ ID NO:5.

16. The DNA construct of Claim 13 which is a vector.

17. An isolated and at least partially purified dicamba-degrading ferredoxin.

18. The dicamba-degrading ferredoxin of Claim 18 which has the amino acid sequence of SEQ ID NO:6.

19. An isolated and at least partially purified dicamba-degrading reductase.

20. An isolated and at least partially purified dicamba-degrading O-demethylase.

21. A transgenic host cell comprising DNA coding for a dicamba-degrading oxygenase operatively linked to expression control sequences.

22. The transgenic host cell of Claim 21 wherein the DNA codes for a dicamba-degrading oxygenase having the amino acid sequence of SEQ ID NO:4.

23. The transgenic host cell of Claim 22 wherein the DNA comprises the nucleotide sequence of SEQ ID NO:3.

24. The transgenic host cell of Claim 21 which is a plant cell.

25. The transgenic host cell of Claim 21 which is a microorganism.

26. A transgenic host cell comprising DNA coding for a dicamba-degrading ferredoxin operatively linked to expression control sequences.

27. The transgenic host cell of Claim 26 wherein the DNA codes for a dicamba-degrading ferredoxin having the amino acid sequence of SEQ ID NO:6.

28. The transgenic host cell of Claim 27 wherein the DNA comprises the nucleotide sequence of SEQ ID NO:5.

29. The transgenic host cell of Claim 26 which is a plant cell.

30. The transgenic host cell of Claim 26 which is a microorganism.

31. The transgenic host cell of Claim 21 further comprising DNA coding for a dicamba-degrading ferredoxin operatively linked to expression control sequences.

32. The transgenic host cell of Claim 31 wherein the DNA codes for a dicamba-degrading ferredoxin having the amino acid sequence of SEQ ID NO:6.

33. The transgenic host cell of Claim 32 wherein the DNA comprises the nucleotide sequence of SEQ ID NO:5.

34. The transgenic host cell of Claim 31 which is a plant cell.

35. The transgenic host cell of Claim 31 which is a microorganism.

36. A transgenic plant or part of a plant comprising one or more cells comprising DNA coding for a dicamba-degrading oxygenase operatively linked to expression control sequences.

37. The transgenic plant or plant part of Claim 36 wherein the DNA codes for a dicamba-degrading oxygenase having the amino acid sequence of SEQ ID NO:4.

38. The transgenic plant or plant part of Claim 37 wherein the DNA comprises the nucleotide sequence of SEQ ID NO:3.

39. The transgenic plant or plant part of Claim 36 wherein the plant is a broadleaf plant which is tolerant to dicamba as a result of the expression of the dicamba-degrading oxygenase and the plant part is a part of a broadleaf plant which is tolerant to dicamba as a result of the expression of the dicamba-degrading oxygenase.

40. The transgenic plant or plant part of Claim 36 wherein the one or more cells further comprise DNA coding for a dicamba-degrading ferredoxin operatively linked to expression control sequences.

41. The transgenic plant or plant part of Claim 40 wherein the DNA codes for a dicamba-degrading ferredoxin having the amino acid sequence of SEQ ID NO:6.

42. The transgenic plant or plant part of Claim 41 wherein the DNA codes for the nucleotide sequence of SEQ ID NO:5.

43. The transgenic plant or plant part of Claim 40 wherein the plant is a broadleaf plant which is tolerant to dicamba as a result of the expression of the dicamba-degrading oxygenase and ferredoxin and the plant part is part of a broadleaf plant which is tolerant to dicamba as a result of the expression of the dicamba-degrading oxygenase and ferredoxin.

44. A method of controlling weeds in a field containing a transgenic plant according to any one of Claims 36-43 comprising applying an amount of dicamba to the field effective to control the weeds in the field.

45. A method of decontaminating a material containing dicamba comprising applying an amount of a transgenic microorganism according to Claim 25 or 35 to the material, the

amount being effective to degrade at least some of the dicamba in the material.

46. A method of decontaminating a material containing dicamba comprising applying an amount of a dicamba-degrading O-demethylase or of a combination of a dicamba-degrading oxygenase, a dicamba-degrading ferredoxin and a dicamba-degrading reductase to the material, the amount being effective to degrade at least some of the dicamba in the material.

47. A method of selecting transformed plant cells comprising:

providing a population of plant cells;

transforming at least some of the plant cells in the population of plant cells with a DNA construct according to any one of Claims 4-16; and

growing the resulting population of plant cells in a culture medium containing dicamba at a concentration selected so that transformed plant cells will grow and untransformed plant cells will not grow.

48. A method of selecting transformed plants comprising:

providing a population of plants suspected of comprising a DNA construct according to any one of Claims 4-16; and

applying an amount of dicamba to the plants selected so that transformed plants will grow, and growth of untransformed plants will be inhibited.

49. A method of selecting, or screening for, transformed host cells, intact organisms, and parts of organisms, the method comprising:

providing a population of host cells, intact organisms, or parts of organisms suspected of comprising a DNA construct according to any one of Claims 4-16;

contacting the host cells, intact organisms, or parts of organisms with dicamba; and

ascertaining the presence or level of fluorescence due to 3,6-dichlorosalicylic acid, the 3,6-dichlorosalicylic acid being generated in transformed host cells, intact organisms, or parts of organisms as a result of the degradation of dicamba.

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